Reg. No. : | | | | | | | | | | |

Question Paper Code: 51204

B.E. / B.Tech. DEGREE EXAMINATION, JUNE 2016

Second Semester

Electrical and Electronics Engineering

15UPH204 – SOLID STATE PHYSICS

(Common to Electronics and Instrumentation Engineering)

(Regulation 2015)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. The low resistivity materials is called as

   (a) Semiconducting materials (b) Superconducting materials
   (c) Conducting materials (d) Dielectric materials

2. According to classical free electron theory, the energy level in a metal is

   (a) Continuous (b) discrete
   (c) overlapping (d) none of these

3. Semiconducting materials have _____ bonds.

   (a) Ionic (b) covalent (c) hydrogen (d) metallic

4. The energy band gap of silicon (Si) is

   (a) 0.72eV (b) 0.92eV (c) 1.1eV (d) 0.11eV

5. The Hard magnet is

   (a) easy to magnetize and demagnetize
   (b) difficult to magnetize and easy to demagnetize
   (c) difficult to magnetize and demagnetize
   (d) easy to magnetize and difficult to demagnetize

6. The magnetic lines of force cannot penetrate the body of a superconductor, a phenomenon is known as

(a) Isotopic effect (b) BCS theory
(c) Meissner effect (d) London theory

7. Local Electric fields is calculated by using method suggested by

(a) Lorenz (b) Weiss (c) Coulomb (d) Curie

8. The dielectric constant for vacuum is

(a) 0 (b) greater than 1 (c) equal to 1 (d) less than 1

9. The size of the nanoparticles is between _____ nm.

(a) 100 to 1000 (b) 0.1 to 10 (c) 1 to 100 (d) 0.01 to 1

10. Which is one of the following nano materials?

(a) Fullerenes (b) Glass (c) plastic (d) rubber

PART - B (5 x 2 = 10 Marks)

11. Give the postulates of classical free electron theory.

12. How can you distinguish p-type and n-type semiconductors using Hall Effect?

13. Define Bohr magnectron.

14. Define dielectric constant.

15. Mention few techniques for synthesis of nanophase materials.

PART - C (5 x 16 = 80 Marks)

1. 16. (a) On the basis of free electron theory derive an expression for the electrical and thermal conductivities of metal and hence establish Wiedemann-Franz law. (16)

Or

(b) Derive an expression for the density of states and based on that calculate the carrier concentration in metals. (16)

17. (a) Derive an expression for density of electron and density of holes in intrinsic semiconductors. (16)

Or

(b) What is Hall effect? Obtain an expression for the Hall coefficient for a p-type and n-type semiconductor. Describe an experimental setup for the measurement of Hall voltage. (16)

18. (a) (i) Explain the hysteresis behaviour of ferromagnetic materials using domain theory. (8)

(ii) Distinguish dia, para, and ferro magnetic materials. (8)

Or

(b) (i) Distinguish between type - I and type - II superconductors. (10)

(ii) Describe high temperature superconductors. (6)

19. (a) What is meant by local field in dielectrics and how it is calculated for a cubic structure? Deduce Clausius –Mosotti equation. (16)

Or

(b) (i) Briefly explain the effect of frequency and temperature on polarization of dielectrics. (8)

(ii) Derive an expression for the ionic polarizability. (8)

20. (a) What are nanoparticles? Explain how nanoparticles can be produced using ball-milling technique. (16)

Or

(b) Discuss about the properties of nano-phase materials and their applications. (16)

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